REMARKS

Claims 1, 2, 21-26, and 28-39 are pending in the Subject Application. Claims 1, 2, 33, and 37 are amended. Claims 23, 25, 28, 30, 36, and 38 are canceled. Claims 3-20 and 27 were previously canceled.

Rejections Under 35 U.S.C. §103(a)

As a preliminary matter, applicants note that the Patent and Trademark Office recently updated the MPEP in light of the Supreme Court's decision in *KSR International Co. v. Teleflex Inc.*, 82 USPQ2d 1385 (2007). The MPEP contains guidelines for determining obviousness under 35 U.S.C. §103 ("Guidelines"). The Guidelines reiterate that the framework for the objective analysis for determining obviousness lies in *Graham v. John Deer Co.* Obviousness is a question of law based on three underlying factual inquiries:

> (1) Determining the scope and content of the prior art;
> (2) Ascertaining the differences between the claimed invention and the prior art; and
> (3) Resolving the level of ordinary skill in the pertinent art. See MPEP 2141(II).

The Guidelines recite the following:

> Prior art is not limited just to the references being applied, but includes the understanding of one of ordinary skill in the art. The prior art reference (or references combined) need not teach or suggest all claim limitations; however, Office personnel must explain why the difference(s) between the prior art and the claimed invention would have been obvious to one of ordinary skill in the art...The gap between the prior art and the claimed invention may not be "so great as to render the [claims] nonobvious to one reasonably skilled in the art." MPEP 2141(III) (emphasis added).

The bases for the Examiner's rejections and applicants responses thereto are discussed below. Applicants wish to point out at the start that there are important, critical differences between the cited references and the claimed alloy and, given the understanding of those skilled in the art at the time of the claimed invention, those differences would have been unexpected. Applicants submit that the gap between the teachings of the prior art and the claimed alloy are sufficiently great as to render the claims nonobvious to one reasonable skilled in the art.

1. The Examiner rejected claims 1, 23-24, 28 and 30-38 under 35 U.S.C. 103(a) as being unpatentable over Beguinot, U.S. Patent No. 5,695,576 (Beguinot) alone, or in the alternative with evidence from the ASM Handbook Volume 1 (the ASM Handbook). Claims 23, 36 and 38 are canceled without prejudice in the instant response to simplify the issues and claims. Claims 1, 33 and 37 are amended to clarify the properties of the claimed alloy. Specifically relevant to the Beguinot patent, applicants have amended claims 1 and 37 to recite the low rate strain-to-failure values from Table 3 on page 8 of the specification instead of the high rate strain-to-failure values because the elongation (ductility low rate strain-to-failure) values Beguinot uses are believed to be based on the more widely used low rate strain-to-failure testing procedures. No new matter is introduced by the change. It is made to be consistent for comparison's sake.

The Examiner has provided a table showing the overlap in the ranges of some elements in the Beguinot and Eglin steel alloys. With respect to missing elements, the Examiner argues that the disclosure in the ASM Handbook that steel intended for forming, drawing or bending would have phosphorous and sulfur contents less than 0.035 wt% and less than 0.040 wt% means that Beguinot would be expected to have those elements in those amounts. The Examiner states at page 5 of the Action, that Beguinot, with evidence from the ASM Handbook Vol. 1, discloses an overlapping composition, a substantially similar method of production, and tensile strengths from above 1200 MPA (174 ksi) up to 1945 MPa (282 ksi). The Examiner concludes that the Beguinot alloy would therefore have a Charpy V-notch impact strength of about 20-43 ft-lb at -40°F and a ductility high rate strain-to-failure[1] of about 15.1 to about 16.6% and cites MPEP 2112.01 I.

MPEP 2112.01 I provides that where "the claimed invention and prior art are identical or substantially identical in structure or composition, or are produced by identical or substantially identical processes, a *prima facie* case of anticipation or obviousness has been established." Section 2112.01 I of the MPEP also states that the "*prima facie* case cane be rebutted by evidence showing that the prior are products do not necessarily posses the characteristics of the claimed product." (emphasis in the original)

[1] Applicants contend that Beguinot's elongation values are low rate strain-to-failure values.

Applicant submits herewith a series of slides which applicants submit rebut the Examiner's case for obviousness. Slides 1 and 2 show a comparison between the properties of the alloy described in Beguinot and applicants' Eglin steel alloy as described and claimed in the Subject Application.

A third slide is enclosed showing the general correlation between tensile strength, measured in MPa, and impact energy, or toughness, measured in Joules. While the specific data points were generated for 4340 steel, a standard low alloy carbon steel, and may not correspond exactly to the Beguinot or Eglin steels, the graph shows the relative relationship of the properties shown in the graph. Those skilled in the art would understand those relationships to hold true for low alloy steels. The graph shows a direct relationship between elongation and impact energy and demonstrates that the lower the elongation percentage due to alloying or heat treatment, the lower the impact energy. Charpy V-notch impact tests and the Izod impact energy shown in the graph of slide 3 are two different means of testing the impact strength or impact energy of a steel alloy. The results may be presented in Joules, as presented by Beguinot in the second table in col. 7 or in ft-lbs as in Table 3 of the specification of the Subject Application.

Referring to slides 1 and 2, total elongation % and Charpy toughness are compared to ultimate tensile strength. The total elongation slide shows an inverse relationship in the Beguinot samples between an increase in ultimate tensile strength and a decrease in total elongation. Sample D in Beguinot has a tensile strength of 1945 MPa, the only sample described in Beguinot that approaches the tensile strength values obtained with applicants' claimed alloy, Eglin steel. The Charpy impact strength values are not provided for sample D in the Beguinot patent. The total elongation percent, however, is provided. It is shown in the second table at col. 8 of the Beguinot patent to be 12.1%. Samples A and C of Beguinot have much lower ultimate tensile strengths, at 1442-1487 MPa and higher elongation percentages at 16.5 and 17.7%. The impact values for samples A and C are shown in J/cm^2 as 45, 49 and 74. There are no impact values provided for samples D and F, but based on the established relationship between elongation and impact energy shown in slide 3, the impact energy for Sample D would be low because the % elongation is low. Comparing the values provided by Beguinot for Samples A, C, D and F (B, E and G are prior art), samples A and C have lower tensile strengths and higher

elongation percentages and impact values at 45, 49 and 74 J/cm^2. Sample F has an even lower tensile strength at 1250MPa and a higher elongation at 18.1%. As one would predict from the curves in the graph in slide 3, as the tensile strength value increases for Sample D relative to that of samples A, C and F the percentage elongation value for sample D decreases. The sample with the lowest tensile strength (F) has the highest percent elongation (18.1%) and the sample with the highest tensile strength (D) has the lowest percent elongation (12.1%). The samples with intermediate tensile strengths (A and C) have intermediate percent elongations (16.5% and 17.7%). The relationships provided in the Beguinot patent demonstrate that the Beguinot alloy exhibits the relationships shown in the graph of slide 3. Thus, the impact strength for sample D would be expected to be low because its tensile strength is high and its percent elongation is low, as predicted.

Looking at slides 1 and 2, applicants' claimed alloy, ES-1 from Table 3, unexpectedly exhibits properties not predicted by the known trend and not consistent with the Beguinot alloy samples; *i.e.*, relatively high % elongation, high Charpy toughness and high ultimate tensile strength. The range for ductility properties of all of the embodiments of the claimed alloy shown in Table 3, 16.6-18.4%, is shown by the arrow between ES-1 and the loop in which the Beguinot alloys fall. Eglin steel stands alone in slides 1 and 2 in the upper right quadrant of the graphs contrary to the trend that one would expect from the prior art. Even if the high rate strain-to-failure values are used in slide 1, applicants' claimed alloy would lie alone in the upper right quadrant of the graph because the combination of high ultimate tensile strength and high ductility are not demonstrated by the Beguinot alloys.

According to MPEP 2112.01 I, the justification for concluding that a *prima facie* case of obviousness has been established is that the claimed invention and prior art are substantially identical in structure or composition or are produced by substantially identical processes. Applicants submit that a *prima facie* case of obviousness has not been made because the Beguinot alloy and Eglin steel products are not substantially identical as demonstrated by their very different overall properties and the fact that they are not made by identical or substantially identical processes. Moreover, according to the MPEP, unless the prior art necessarily has the claimed characteristics of Eglin steel, the Examiner's case for obviousness is rebutted.

Applicants submit that the properties exhibited by the Beguinot alloy samples and the consistency of the behavior of those samples with the trends predicted in the literature mean that the Beguinot alloy does not exhibit the combination of properties, high ultimate tensile strength and high Charpy toughness (impact strength), that are the same as or even similar to those that applicants have achieves for Eglin steel.

As stated before during this prosecution, it is believed that the combination of properties exhibited by the Eglin steel product are the result of the specific combination of the elements listed in the claims in the amounts listed and the structure of the Eglin steel product resulting from the manner of treating the combination of elements. Although the present claims are not method claims and include no process steps, those skilled in the art recognize that different processing steps for the same elements can produce products having very different properties. That is believed to be due to differences in the microstructure of the alloyed elements. In other words, the Beguinot alloys and the Eglin steel alloys are different products.

Beguinot describes the process for making its alloys as follows: after smelting, casting and solidifying, steel sheets are austenitized at about 900 °C for 30 minutes, the steel is cooled to room temperature by air at a rate of 0.02 °C per second. In the examples, Beguinot air cools with a 20 minute hold period at 338 °C and then continues to air cool to room temperature. Eglin steel on the other hand is produced by a much different process. In Eglin steel, the sheet is normalized to 940-968 °C and held at about 954 °C for one hour per one inch section, cooled to room temperature, austenitized to 913-940 °C, held at about 927 °C for one hour per one inch section, quenched and then tempered at about 260 °C for one hour per one inch section, then cooled to room temperature. The Beguinot process does not disclose normalizing and cooling steps prior to austenitizing and does not disclose quenching and tempering steps after austenitizing. In other words, the Beguinot alloys and the Eglin steel alloys are made by different processes.

Because the claimed steel and the Beguinot alloys are not substantially identical in composition or structure and are not made by substantially identical processes, applicants submit that a *prima facie* case of obviousness has not been established. Further, because the Beguinot alloys do not necessarily have the same or similar properties or characteristics as the claimed

alloy, to the extent that one might believe that a *prima facie* case for obviousness has been established, the evidence submitted rebuts any case for obviousness. MPEP 2112.01 I.

Claims 1, 2, 24 and 39 define an alloy having a tensile strength between 233-270 ksi (1608 - 1863 MPa) and a Charpy impact value at -40 °F of 20-43 ft-lbs (27-57 Joules). Applicants have demonstrated that the Beguinot alloys would not have both a high ultimate tensile strength and a high Charpy impact value. Therefore, based on the foregoing, applicants submit that claims 1, 24, 31-35 and 37 are not obvious over the Beguinot patent, alone or in combination with the ASM Handbook, Vol. 1. Withdrawal of the rejection is requested.

2. The Examiner rejected claims 2, 29 and 39 under 35 U.S.C. 103(a) as being unpatentable over Beguinot alone, or alternatively with evidence from the ASM handbook Volume 1, in view of Yoshie et al., U.S. Patent No. 5, 454,883 (Yoshie). Applicants have demonstrated that Beguinot does not teach or suggest the claimed alloy and importantly, that the claimed alloy would be unexpected in view of the teachings of Beguinot and the ASM Handbook. Applicants have already demonstrated in the response dated July 23, 2007 that the Yoshie patent does not render the claimed alloy obvious. In the present Action, the Examiner agreed and withdrew the prior rejection over Yoshie in view of applicants' arguments and Declaration dated July 9, 2007.

In the July 23, 2007 reply, applicants argued as follows:

> Yoshie et al. do not disclose comparable ultimate tensile strengths. As explained above ... 226 ksi or 227 ksi is not comparable to 233-270 ksi and certainly not comparable to 245 ksi, for steel alloys required for the military applications for which applicants' steel alloy was developed. Yoshie teaches processing the disclosed mix of elements at tempering temperatures of A_{C1} and above (*see for example,* Yoshie et al., col. 16, lines 42, 56, 64, col. 17, line 3, in Tables 3, 7 and 11 and the claims). A temperature of A_{C1}, as explained in the enclosed Declaration of John Paules, is higher than the normal tempering temperatures of about 1000 °F to 1200 °F. The tempering temperature for the claimed steel alloy is between about 400-500 °F.
>
> The heat treatment used to make the steel alloy of the Subject Application produces unique mechanical properties which are significantly different from the properties that would be obtained as a result of the manufacturing temperatures taught in the Yoshie patent. The Subject Application teaches that the claimed alloy is tempered at a low temperature of about 260°C (500°F) to produce a very high ultimate tensile strength ranging from about 233 to 270 ksi and typically, about 247 ksi, as shown in Table 3 of

the Subject Application. The alloy of the Subject Application, produced as described therein, has a Charpy V-notch impact strength ranging from about 20 to 43 ft-lb. at -40°F, also shown in Table 3 of the Subject Application. The low tempering temperature used to make the claimed alloy also imparts a high degree of strain hardening (a low yield strength/tensile strength ratio), which allows products made with the claimed alloy to absorb high strain without fracturing.

The steels described in the Yoshie et al. and Gondo et al. patents are tempered at significantly higher temperatures to produce alloys having lower strength levels. Even if the elements recited in the Yoshie and/or Gondo patents were to be used in the amounts described in the ranges described, the final product produced would have different properties from those of the claimed alloy because of the difference in the tempering temperature used. As John Paules concluded in his Declaration enclosed herewith, "the material of Yoshie et al. would not have the impact strength, ultimate tensile strength and strain-to-failure rate of Eglin Steel."

Applicants submit that the combination of Beguinot and the ASM Handbook with Yoshie, in any combination, does not disclose or suggest the claimed alloy having the claimed properties. Withdrawal of the rejection of claims 2, 29 and 39 under 35 U.S.C. §103(a) as being unpatentable over any combination of Beguinot, Yoshie or the ASM Handbook is requested.

3. The Examiner rejected claims 1 and 32-33 and 35 under 35 U.S.C. §103(a) as being unpatentable over Gondo et al., U.S. Patent No. 3,574,602 (Gondo) alone, or alternatively with evidence from the ASM Handbook Vol. 1. The Examiner relies on the overlap between the relative amounts of certain of the elements described in the Gondo patent and elements included within the claimed steel alloys. The ASM Handbook is added for its disclosure regarding amounts of phosphorous and sulfur taught in the handbook to prevent cracking or splitting. The Examiner asserts at page 11 of the Action that 1 weight percent of tungsten as disclosed by Gondo is close to about 1.17 weight percent tungsten as recited in claims of the Subject Application. The Examiner further states his belief that Gondo's disclosure of tensile strengths in the range of 130-159 kg/mm^2 (184-226 ksi) would meet the limitation of "about 233-270 ksi of claim 1, about 244 ksi of claim 32, about 234 ksi of claim 33 and about 248 ksi of claim 35" because the term "about" is not defined to exclude such values. Finally, the Examiner states that the alloy steel of Gondo would inherently have a Charpy V-notch impact strength of about 20-43 at -40 °F and a strain-to-failure rate of about 15.1 to about 16.6% because Gondo discloses comparable tensile strength and a substantially similar composition as that claimed. The

Examiner cites MPEP sections 2144.05 I and 2112.01 I.

The Examiner is correct that the specification contains no specific definition of the term "about". Therefore, the term would be given its ordinary meaning within the context of, and consistent with its use in, the specification. Claim 1 has been amended to delete the term "about" as it modified the lower range of tungsten, ultimate tensile strength, impact strength and ductility low rate strain-to-failure values. Claim 33 has been amended to delete "about". Claims 32 and 35 depend from claim 1 and include its limitations. The more specific ultimate tensile strength values recited in claims 32 and 35 are not remotely close to the values Gondo discloses. The Examiner's argument with respect to "about" is now moot.

MPEP 2144.05 III provides that applicants can rebut a *prima facie* case of obviousness based on overlapping ranges by showing the criticality of the claimed range; that the claimed range achieves unexpected results relative to the prior art or that the art, in any material respect, teaches away from the claimed invention.

The ultimate tensile strength of 233-270 ksi recited in the claims, and in particular, the ultimate tensile strength of 245 ksi or greater for alloys used in certain military applications, is critical. Gondo does not disclose an alloy having ultimate tensile strengths comparable to the ultimate tensile strengths of 233-270 ksi recited in the claims of the Subject Application. Gondo's maximum ultimate tensile strength is 226 ksi. Although the difference between Gondo's maximum of 226 ksi and applicant's claimed minimum of 233 ksi, is 6, the difference between Gondo's maximum and applicants' average or maximum ultimate tensile strength values is significant. Those differences are critical differences.

Applicants have shown hereinabove that the values for ultimate tensile strength, impact strength and ductility achieved by applicants claimed alloy were unexpected at the time of the invention based on conventional teachings of the expected trends for those properties. The Examiner attempts to read into Gondo the unexpected combination of high ultimate tensile strength, high impact strength and high ductility that applicants obtained for their claimed alloy, when there is nothing in Gondo to suggest that Gondo obtained that combination of values.

In the July 2007 Response, applicants submitted the Declaration of John Paules wherein Mr. Paules stated his understanding of the process that Gondo might have used based on some hints in the Gondo patent and the knowledge at the time of the Gondo patent. Mr. Paules stated in his Declaration that the processes used at that time would have used tempering temperatures significantly higher than those used to produce Eglin steel. Those processes could not produce an alloy having the properties exhibited by the claimed alloy.

Notwithstanding the foregoing, the Examiner rejected applicants' prior argument based on MPEP 2144.08, II B that because Gondo fails to disclose the process for making the alloy described therein, it may not be legally concluded that the compound itself is in the possession of the public. Applicants respectfully disagree and again assert that Gondo is silent as to the manner of making the alloy described therein. As applicants have demonstrated time and again during the prosecution of the Subject Application, the process of making the alloy is critical to the difference in the resulting product and its properties. "A conclusion of obviousness requires that the reference(s) relied upon be enabling in that it put the public in possession of the claimed invention." *See* MPEP §2144.08, II B. Where the prior art fails to disclose a method for making a compound, "it may not be legally concluded that the compound itself is in the possession of the public." "In this context, ... the absence of a known or obvious process for making the claimed compounds overcomes a presumption that the compounds are obvious, based on close relationships between their structures and those of prior art compounds." MPEP §2144.08, II B quoting *In re Hoeksema*, 399 F.2d 269, 274, 158 U.S.P.Q 596, 601 (CCPA 1968). In the case of the Gondo reference, there was a known process at the time the Gondo patent application was filed and one that one skilled in the art would assume was used in the absence of any processes taught by Gondo. That known obvious process used a very high tempering temperature and would have produced an alloy having very different impact strength values.

Section 2112.01 I of the MPEP, which the Examiner cited, states that the "*prima facie* case can be rebutted by evidence showing that the prior are products do not necessarily possess the characteristics of the claimed product." Further, the Gondo patent does not disclose the critical ultimate tensile strength values, which applicants have shown would have been unexpected. For the foregoing reasons, applicants submit that the Gondo patent does not

disclose steel alloys that "necessarily possess the characteristics of the claimed steel alloy." According to the Action, at page 7, the Examiner's *prima facie* case is rebutted. Applicants respectfully request the withdrawal of the rejection of claims 1, 32, 33 and 35 under 35 U.S.C. §103(a) in view of the Gondo patent with or without the ASM Handbook.

4. The Examiner rejected claim 21 under 35 U.S.C. §103(a) as being unpatentable over Gondo in view of Lyon, U.S. Patent No. 2,942,339 (Lyon). The Examiner rejected claims 21 and 25-26 under 35 U.S.C. §103(a) as being unpatentable over Beguinot alone, or in the alternative with evidence from the ASM Handbook and further in view of Lyon. Claim 25 has been canceled. The Examiner rejected claim 22 under 35 U.S.C. §103(a) as being unpatentable over Beguinot alone, or in the alternative with evidence from the ASM Handbook, in view of Yoshie and further in view of Lyon.

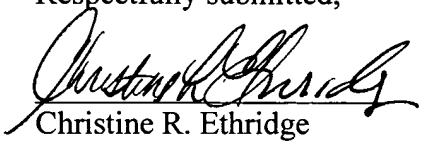
Based on the differences between the claimed alloys and the teachings of the Beguinot, Gondo and Yoshie patents, without the ASM handbook, as discussed above, applicants submit that claims 21, 22, and 26 are not obvious in view of the combination of any of the cited references in combination with Lyon. No combination of the references discloses an alloy having the combination of properties that applicants' claimed alloy possesses. Applicants have demonstrated that the properties of its claimed alloy are unexpected and not disclosed by the cited references. Withdrawal of the rejection of claims 21, 22, and 26 under 35 U.S.C. §103(a) is respectfully requested.

As stated above, there are important, critical differences between the cited references and the claimed alloy and, given the understanding of those of ordinary skill in the art at the time of the claimed invention, those differences would have been unexpected. Applicants submit that the gap between the teachings of the prior art and the claimed alloy are sufficiently great as to render the claims nonobvious to one reasonable skilled in the art. Reconsideration and allowance of claims 1, 2, 21, 22, 24, 26, 27, 31-35, 37 and 39 as amended, are respectfully requested.

Conclusion

Applicants have made every effort to advance prosecution of the Subject Application. The claims are believed to be in condition for allowance. Reconsideration and allowance of claims 1, 2, 21, 22, 24, 26, 27, 31-35, 37 and 39 as amended, are respectfully requested. If the undersigned can be of any assistance to the Examiner in advancing the application to allowance, the Examiner is urged to contact the undersigned attorney at the number set forth below.

Respectfully submitted,



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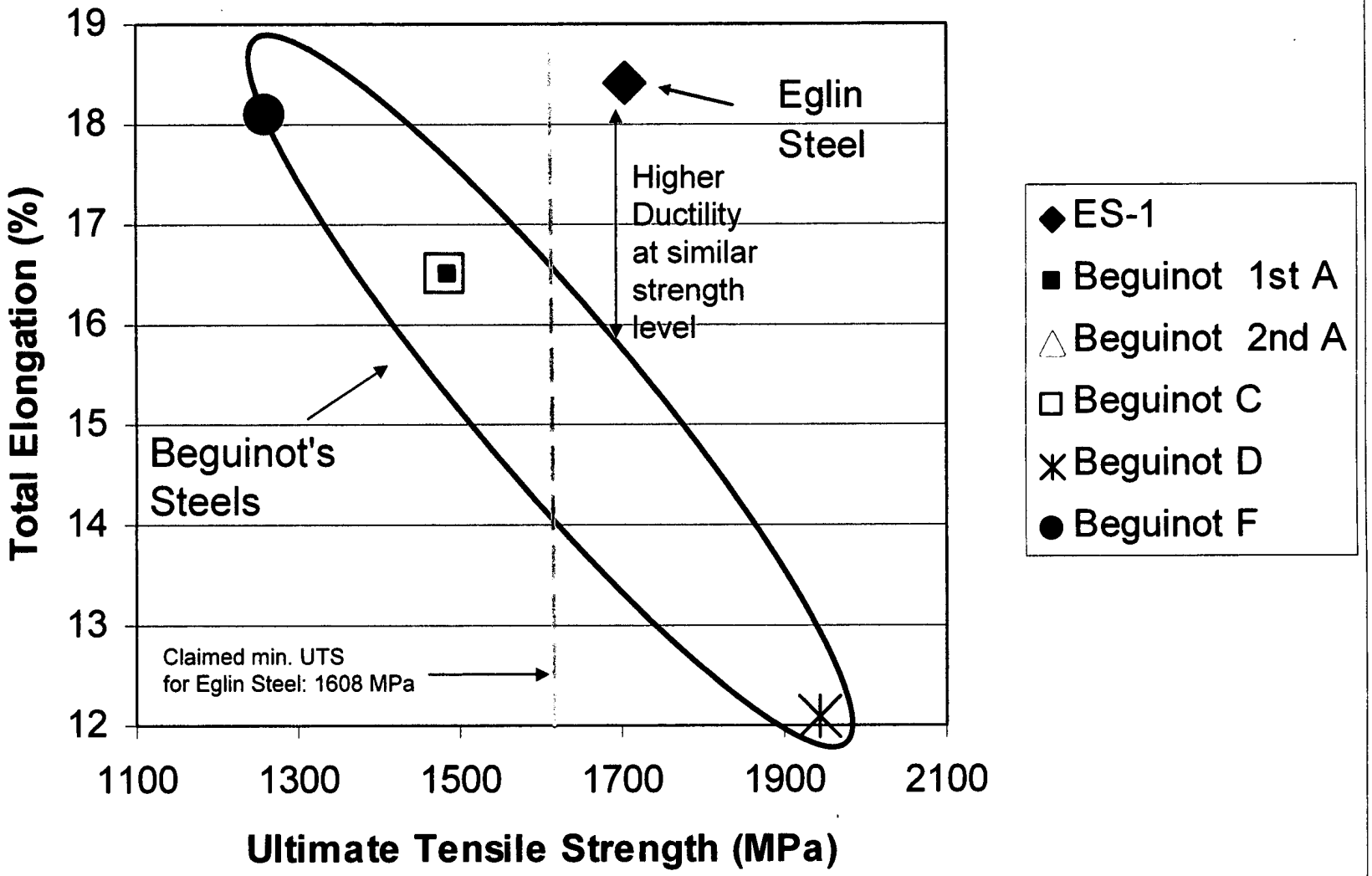
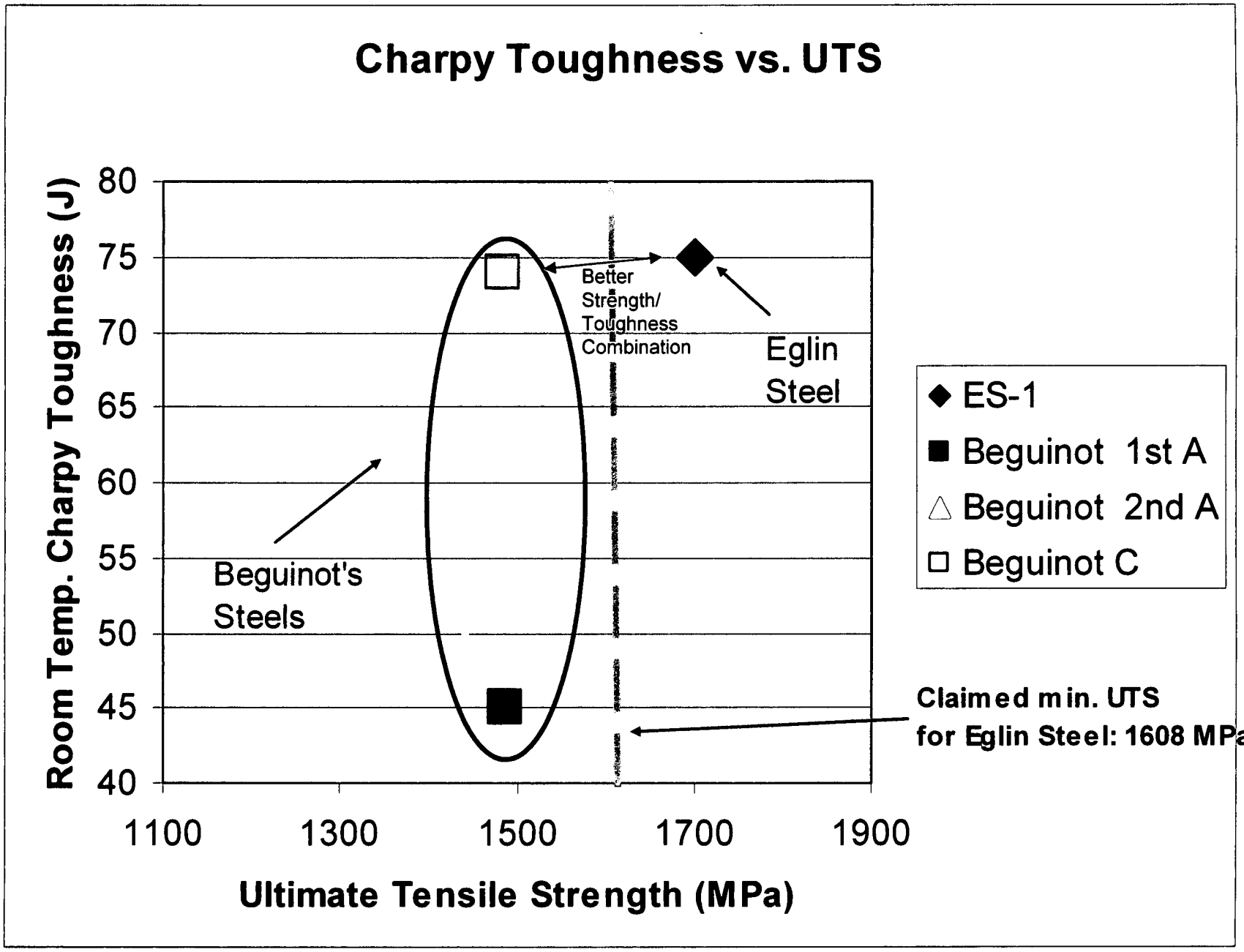
(Attachments, 3 slides)

Total Elongation vs. UTS

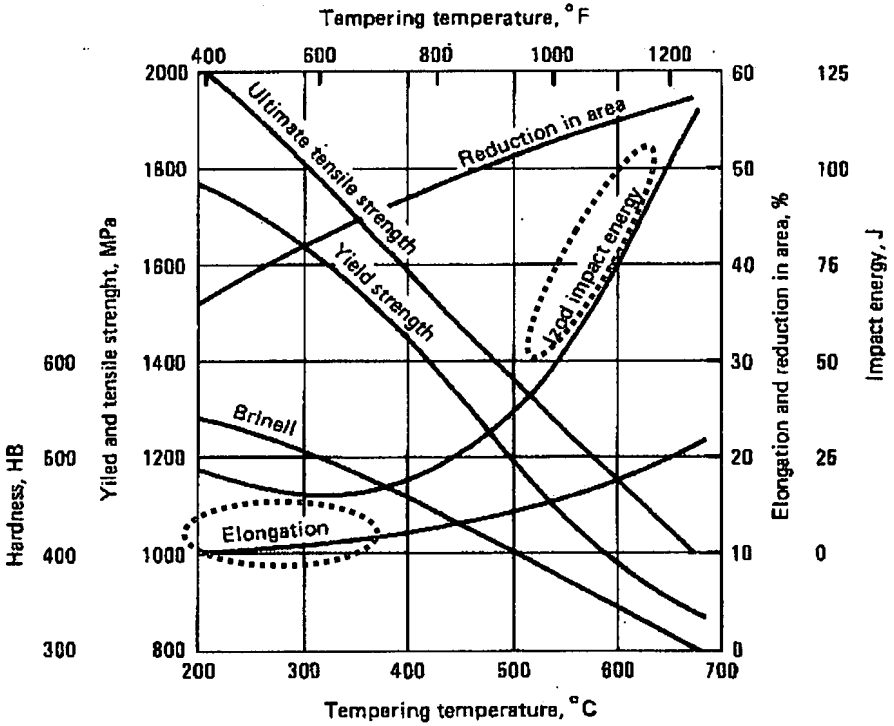


SLIDE 2


Charpy Toughness vs. UTS
Room Temp. Charpy Toughness (J)
80
75
70
65
60
55
50
45
40
1100
1300
1500
1700
1900
Ultimate Tensile Strength (MPa)
Better Strength/ Toughness Combination
Eglin Steel
Beguinot's Steels
ES-1
Beguinot 1st A
Beguinot 2nd A
Beguinot C
Claimed min. UTS for Eglin Steel: 1608 MPa

Correlation of Tensile Elongation and Impact Energy (Toughness)

Fig. 30 Effect of tempering temperature on mechanical properties of 4340 steel



Variation with tempering temperature of room-temperature mechanical properties of 4340 steel. Specimens 25 mm (1 in.) in diameter were oil hardened from 830 °C (1525 °F) and tempered at the indicated temperature.

Source: ASM Metals Handbook, Ninth Edition